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JC678 U.S. PTO 09/472519 12/27/99

Box PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Re: New U.S. Patent Appln.
Our Ref: **381HI/48491**

Sir:

Transmitted herewith for filing is the patent application of:

Keiji ODA and Suetaro SHIBUKAWA

entitled: **PERMANENT MAGNET TYPE ROTARY ELECTRIC MACHINE AND ELECTRICALLY DRIVEN VEHICLE USING THE SAME**

Enclosed are:

1. Specification, including 9 claims (pages 1-19).

2. X Sheet(s) of X Formal ______ Informal drawings showing Figs. 1-4.

3. X Declaration and Power of Attorney **(EXECUTED)**.

4. Assignment of the invention to Hitachi, Ltd. and Hitachi Car Engineering Co., Ltd.

5. Certified copy of Priority Document 10-369970 filed in Japan on 25 December 1998, the priority of which is being claimed under 35 U.S.C. §119 and 37 C.F.R. §1.55.

6. The filing fee has been calculated as shown below:

Basic Fee					$380/760	=	$760.00
Total Claims	9	- 20 =	0	x	$ 9/18	=	$
Independent Claims	8	- 3 =	5	x	$39/78	=	$390.00
Multiple Dependent Claim Presented					$130/260	=	$
Total Filing Fee							$1150.00

Checks in the amount of $ 1,150.00 for X filing fee and $40.00 for X assignment recording fee are enclosed.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 05-1323 (Docket #381HI/48491). A duplicate copy of this sheet is enclosed.

Respectfully submitted,

James F. McKeown
Reg. No. 25,406

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PERMANENT MAGNET TYPE ROTARY ELECTRIC MACHINE AND ELECTRICALLY DRIVEN VEHICLE USING THE SAME

BACKGROUND OF THE INVENTION

The present invention relates to a compact, lightweight, high-torque permanent magnet type rotary electric machine suitable for use at high temperatures, and also to an electrically driven vehicle using the rotary electric machine.

A driving motor for use in an electrically driven vehicle, especially, in an electric vehicle is desired to have a compact, lightweight configuration and high efficiency, because the capacity of a battery mounted on the electric vehicle is limited and it is necessary to ensure a sufficient distance traveled by the capacity of the battery once fully charged.

To make a motor compact and lightweight, it is desired to be fit for high-speed rotation. Further, as a high-efficient motor, a permanent magnet motor is recommendable rather than a DC motor and an induction motor. In particular, as compared with a surface magnet motor having permanent magnets on the outer circumferential surface of a rotor, a so-called internal magnet motor having a permanent magnet holding portion in a steel plate, e.g., a silicon steel plate, having a permeability higher

than that of permanent magnets is suitable for the high-efficient motor. The reason is that the internal magnet motor can be operated up to high speeds by field weakening control and can be operated with high efficiency by field weakening control.

Further, as compared with the rotor of the surface magnet motor, the rotor of the internal magnet motor has an advantage such that the rotational strength of the rotor is determined by the strength of the silicon steel plate, resulting in high reliability in high-speed rotation. An example of such a motor configuration is disclosed in Japanese Patent Laid-open No. 3-138050.

The motor configuration disclosed in this publication is such that permanent magnets are embedded in a rotor core formed of a magnetic material having a permeability higher than that of the permanent magnets, and that auxiliary magnetic poles composed of the permanent magnets and the rotor core are arranged in a circumferential portion of the rotor core. By forming such an internal magnet configuration that the permanent magnets are embedded in the rotor core formed of a magnetic material having a permeability higher than that of the permanent magnets, field weakening control can be performed and the motor can be operated with high efficiency up to a high-speed region.

However, the motor configuration disclosed in the above publication has no consideration on a fixing method for the permanent magnets, especially, on a fixing method for the permanent magnets in the axial direction of the rotor core. Although the above publication describes that the permanent magnets are bonded in holes, there is a possibility that the permanent magnets may axially escape from the holes because of a reduction in adhesive strength by bonding only in the case of a rotary electric machine to be operated at high temperatures.

To cope with this problem, a pair of retainer plates (which will be hereinafter referred to as side rings) for preventing the escape of the permanent magnets are mounted on the axial ends of the rotor. Each side ring is formed of a nonmagnetic material to prevent short of magnetic flux. However, in the case that each side ring is formed of a metal material, an eddy current is generated in each side ring by a change in magnetic flux from stator windings, because of conductivity of the metal material, causing abnormal heating of each side ring. Accordingly, there is a possibility of high-temperature demagnetization of the permanent magnets due to the heat from each side ring.

SUMMARY OF THE INVENTION

It is accordingly an object of the present invention to provide a permanent magnet type rotary electric machine which can prevent thermal demagnetization of the permanent magnets to thereby effect a reduction in size and weight and a high torque.

It is another object of the present invention to provide an electrically driven vehicle using the permanent magnet type rotary electric machine.

According to an aspect of the present invention, the outer diameter of each of a pair of retainer plates mounted on the axial ends of a rotor core is set smaller than the outer diameter of the rotor core, thereby suppressing the generation of an eddy current in each retainer plate due to magnetic flux from stator windings.

Preferably, the difference between the outer diameter of the rotor core and the outer diameter of each retainer plate is set to 1/2 or more of the difference between the inner diameter of the stator core and the outer diameter of the rotor core.

According to another aspect of the present invention, each retainer plate is formed of a metal material having a resistivity of 10 $\mu\Omega$ cm or higher, thereby suppressing the generation of an eddy current in each retainer plate due to magnetic flux from the stator windings.

According to a further aspect of the present invention, the outer diameter of each retainer plate is set smaller than the outer diameter of the rotor core, and each retainer plate is formed of a metal material having a resistivity of 10 $\mu\Omega$ cm or higher, thereby suppressing the generation of an eddy current in each retainer plate due to magnetic flux from the stator windings.

According to a still further aspect of the present invention, each retainer plate is a nonmagnetic member formed of a nonmetal material, thereby suppressing the generation of an eddy current in each retainer plate due to magnetic flux from the stator windings.

According to a still further aspect of the present invention, there is provided an electrically driven vehicle comprising a battery for supplying a DC voltage; an inverter for converting the DC voltage supplied from the battery into an AC voltage; and a permanent magnet type rotary electric machine for outputting a drive torque for driving the vehicle at the AC voltage. The permanent magnet type rotary electric machine in this electrically driven vehicle is the permanent magnet type rotary electric machine according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an axial sectional view of a permanent magnet type rotary electric machine according to a preferred embodiment of the present invention;

FIG. 2 is a cross section taken along the line A-A in FIG. 1;

FIG. 3 is an enlarged view of a portion B shown in FIG. 1; and

FIG. 4 is a perspective view showing a schematic configuration of an electric vehicle using the permanent magnet type rotary electric machine of the present invention.

[Explanation of Reference Numerals]

1: rotary electric machine 2: stator 3: rotor 4: stator core 5: stator windings 6: permanent magnets 8: rotor core 81: side rings 9: rotating shaft 10: housing 11: end bracket 12: bearings

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

There will now be described a permanent magnet type rotary electric machine and an electrically driven vehicle using the same according to a preferred embodiment of the present invention with reference to the drawings.

FIG. 1 is an axial sectional view of a permanent magnet type rotary electric machine (which will be hereinafter referred to simply as a rotary electric

machine) 1 according to a preferred embodiment of the present invention, and FIG. 2 is a cross section taken along the line A-A in FIG. 1. The rotary electric machine 1 is composed generally of a stator 2 and a rotor 3.

The stator 2 is composed of a cylindrical housing 10, an end bracket 11 fixed to the housing 10 by bolts, a cylindrical stator core 4 fixed to the inner circumferential surface of the housing 10, and a plurality of stator windings 5 wound on the stator core 4.

The rotor 3 is composed of a cylindrical rotor core 8, a plurality of permanent magnets 6 inserted in a plurality of holes 7 formed in the rotor core 8 near its outer circumferential surface, a rotating shaft 9 fixed to the rotor core 8 at its central portion, and a pair of side rings 81 mounted on the axial opposite ends of the rotor core 8 for retaining the rotor core 8 and the permanent magnets 6. The rotating shaft 9 is rotatably supported at its opposite ends to a pair of bearings 12 fixed to the end bracket 11 and the housing 10. The end bracket 11 is screwed to be fixed to the housing 10 of the rotator 2 side. Each of the permanent magnets 6 is arcuate as shown in FIG. 2, and they are arranged in the circumferential direction of the rotor core 8 with a given pitch. However, the shape of each permanent magnet 6 is merely illustrative and not limitative in the present invention.

Each side ring 81 is formed of a nonmagnetic material to prevent short of the magnetic flux generated by the permanent magnets 6. In the case that each side ring 81 is formed of a nonmagnetic metal material, it is affected by a change in the magnetic flux generated by the stator windings 5 because of the conductivity of the metal material, resulting in generation of an eddy current in each side ring 81 to cause abnormal heating of each side ring 81. This heat is transmitted to the permanent magnets 6 to possibly demagnetize the permanent magnets 6. Particularly in the case that each permanent magnet 6 is a rare-earth magnet, it has such a characteristic that demagnetization tends to occur at high temperatures. Therefore, it is necessary to prevent heating of each side ring 81, thereby preventing a reduction in performance of the rotary electric machine.

To reduce the influence of a change in magnetic flux from the stator windings 5 and thereby suppress the generation of an eddy current, the outer diameter of each side ring 81 is set smaller than the outer diameter of the rotor core 8.

Such a diameter difference will now be described in more detail with reference to FIG. 3 which is an enlarged view of a portion B shown in FIG. 1. The difference between the outer diameter D2 of the rotor core 8 and the

outer diameter D3 of each side ring 81 is set preferably to 1/2 or more of the difference between the inner diameter D1 of the stator core 4 and the outer diameter D2 of the rotor core 8.

The reason for this setting will now be described.

In considering the influence of an eddy current on each side ring 81 as a force F acting between the stator core 4 and the rotor core 8, the following equation holds.

$$F = k \cdot 1/\delta_1^2 \quad \ldots (1)$$

where δ_1 is the difference between the inner diameter D1 of the stator core 4 and the outer diameter D2 of the rotor core 8, and k is the constant determined by a shape, a voltage input to the stator, etc.

Eq. (1) also holds for the difference δ_2 between the outer diameter D2 of the rotor core 8 and the outer diameter D3 of each side ring 81, so that the relation between F and δ_2 is shown in Table 1.

Table 1

δ_2	F	Ratio of decrease in F to δ_2	
0.5	4k	-	the same as δ_1
0.6	2.8k	70%	
0.75	1.8k	45%	1.5 times δ_1
1.00	1.0k	25%	
1.25	0.64k	16%	

As understood from Table 1, the influence of an eddy current generated in each side ring 81 due to the magnetic flux generated by the stator windings 5 can be reduced to a half or less by setting δ_2 to a value 1.5 times or more δ_1, i.e., by setting the difference between the outer diameter D2 of the rotor core 8 and the outer diameter D3 of each side ring 81 to 1/2 or more of the difference between the inner diameter D1 of the stator core 4 and the outer diameter D2 of the rotor core 8.

When the eddy current becomes a half, the loss W is reduced to 1/4 in accordance with the following equation.

$$W = I^2 \cdot R \qquad \dots (2)$$

where R is the electrical resistance.

Accordingly, a temperature rise of each side ring 81 is also reduced to 1/4.

Thus, the influence of the eddy current is reduced in proportion to the square of a distance, so that it is preferable to maximize the difference δ_2 between the outer diameter of the rotor core 8 and the outer diameter of each side ring 81.

It is sufficient to use a nonmagnetic material as the material of each side ring 81. However, if the nonmagnetic material is a material having a relatively low

resistivity, such as copper and aluminum, the amperage of the eddy current is large. Accordingly, a nonmagnetic metal material having a relatively high resistivity of 10 $\mu\Omega$ cm or higher, such as stainless steel, is preferable as the material of each side ring 81.

An increase in resistivity means an increase in electrical resistance R in the following equation.

$$I = E/R \qquad \cdots(3)$$

where E is the voltage induced to each side ring.

In comparing aluminum (resistivity: 2.8 $\mu\Omega$ cm) and stainless steel (resistivity: 10 $\mu\Omega$ cm), the resistivity of stainless steel is higher than the resistivity of aluminum by 3.6 times. Accordingly, the amperage in stainless steel becomes 1/3.6 of the amperage in aluminum, and a temperature rise in stainless steel can be reduced to 1/13 of that in aluminum.

More preferably, the above-mentioned two features are combined. That is, the outer diameter of each side ring 81 is set smaller than the outer diameter of the rotor core 8, and the material of each side ring 81 is a metal material such as stainless steel having a resistivity of 10 $\mu\Omega$ cm or higher, thereby enhancing the effect.

Further, if the operating temperature condition and

the rotational strength of the rotary electric machine 1 are allowed, a nonmetal material such as resin may also be used as the material of each side ring 81. The resistivity of a resin material is much higher than that of a metal material, so that no eddy current flows in each side ring 81, thereby eliminating abnormal heating. In the case of applying a resin material to the opposite ends of the rotor core 8 to configure the side rings 81, a method of mounting platelike members of resin on the opposite ends of the rotor core 8 and a resin molding method of molding the opposite ends of the rotor core 8 with resin may be realized.

Having thus described a specific preferred embodiment employing an internal rotor, the present invention is applicable alto to a rotary electric machine employing an external rotor or the like having a structure such that both sides of magnets are sandwiched by a pair of side rings.

Further, the rotary electric machine of the present invention is effective in the case that it is used as a drive motor for an electrically driven vehicle.

As an example of the electrically driven vehicle using the rotary electric machine of the present invention as a drive motor, a schematic configuration of an electric vehicle is shown in FIG. 4. The electric vehicle includes

a rotary electric machine 10 according to the present invention, a battery 20 for supplying a DC voltage, an inverter 30 for converting the DC voltage supplied from the battery into an AC voltage, and a control unit 40 for controlling a drive torque and a rotating speed of the rotary electric machine 10. Accordingly, the drive wheels of the vehicle are driven by the rotary electric machine 10 with a given torque and rotating speed controlled by the control unit 40.

The rotary electric machine of the present invention can suppress a temperature rise as compared with a conventional rotary electric machine. Accordingly, the rotary electric machine of the present invention can be reduced in size to contribute to mountability on the vehicle and weight reduction of the vehicle, thereby improving the performance of the vehicle.

According to the present invention, thermal demagnetization of the permanent magnets can be prevented to thereby effect a reduction in size and weight of the permanent magnet type rotary electric machine and also effect a high torque thereof.

Further, by applying the permanent magnet type rotary electric machine of the present invention to an electrically driven vehicle, the vehicle can be reduced in weight to thereby improve the performance of the vehicle.

WHAT IS CLAIMED IS:

1. A permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets embedded in said rotor core and arranged in a circumferential direction of said rotor core, and a pair of retainer plates mounted on the axial ends of said rotor core;

wherein the outer diameter of each of said retainer plates is set smaller than the outer diameter of said rotor core.

2. A permanent magnet type rotary electric machine according to claim 1, wherein the difference between the outer diameter of said rotor core and the outer diameter of each of said retainer plates is set to 1/2 or more of the difference between the inner diameter of said stator core and the outer diameter of said rotor core.

3. A permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets embedded in said rotor core and arranged in a circumferential direction of said rotor core, and a pair of retainer plates mounted on the axial ends of said rotor core;

wherein each of said retainer plates is formed of a metal material having a resistivity of 10 $\mu\Omega$ cm or higher.

4. A permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets embedded in said rotor core and arranged in a circumferential direction of said rotor core, and a pair of retainer plates mounted on the axial ends of said rotor core;

wherein the outer diameter of each of said retainer plates is set smaller than the outer diameter of said rotor

core, and each of said retainer plates is formed of a metal material having a resistivity of 10 $\mu\Omega$ cm or higher.

5. A permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets embedded in said rotor core and arranged in a circumferential direction of said rotor core, and a pair of nonmagnetic members mounted on the axial ends of said rotor core;

wherein each of said nonmagnetic members is formed of a nonmetal material.

6. A permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets arranged in a circumferential direction of said rotor core, and a pair of retainer plates mounted on the

axial ends of said rotor core;

wherein the outer diameter of each of said retainer plates is set smaller than the outer diameter of said rotor core.

7. A permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets arranged in a circumferential direction of said rotor core, and a pair of retainer plates mounted on the axial ends of said rotor core;

wherein each of said retainer plates is formed of a metal material having a resistivity of 10 $\mu\Omega$ cm or higher.

8. A permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets arranged in a circumferential direction of said

rotor core, and a pair of nonmagnetic members mounted on the axial ends of said rotor core;

wherein each of said nonmagnetic members is formed of a nonmetal material.

9. An electrically driven vehicle comprising:

a battery for supplying a DC voltage;

an inverter for converting said DC voltage supplied from said battery into an AC voltage; and

a permanent magnet type rotary electric machine for outputting a drive torque for driving said vehicle at said AC voltage;

said permanent magnet type rotary electric machine comprising:

a stator having a cylindrical stator core and a plurality of stator windings wound on said stator core; and

a rotor having a cylindrical rotor core opposed to an inner circumferential surface of said stator core with a given gap defined therebetween, a plurality of permanent magnets embedded in said rotor core and arranged in a circumferential direction of said rotor core, and a pair of retainer plates mounted on the axial ends of said rotor core;

wherein the outer diameter of each of said retainer plates is set smaller than the outer diameter of said rotor core.

ABSTRACT OF THE DISCLOSURE

A plurality of permanent magnets 6 are embedded in a cylindrical rotor core 8 and arranged in a circumferential direction of the rotor core 8. A pair of side rings 81 are mounted on the axial ends of the rotor core 8. The outer diameter of each side ring 81 is set smaller than the outer diameter of the rotor core 8. With this structure, an eddy current generated in each side ring 81 can be suppressed to thereby prevent abnormal heating and accordingly prevent thermal demagnetization of the permanent magnets 6.

F I G. 1

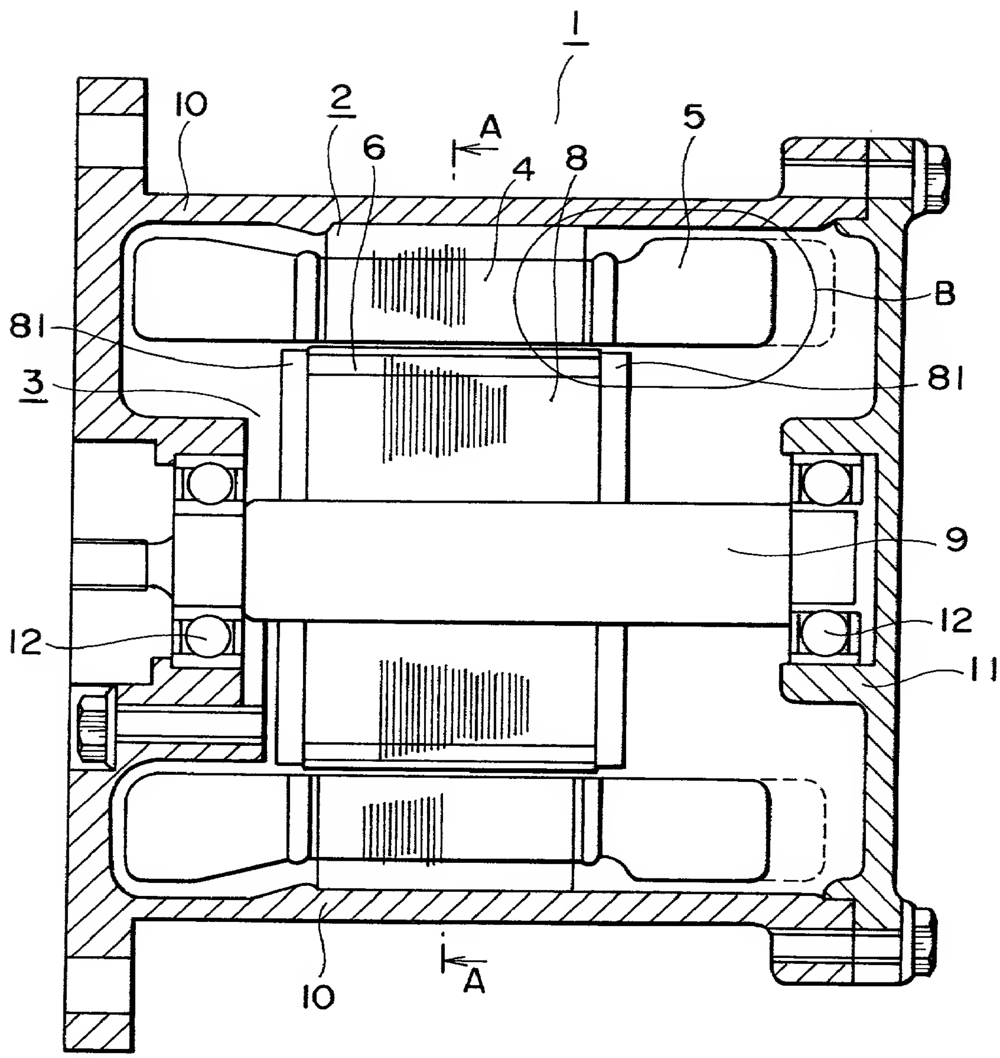
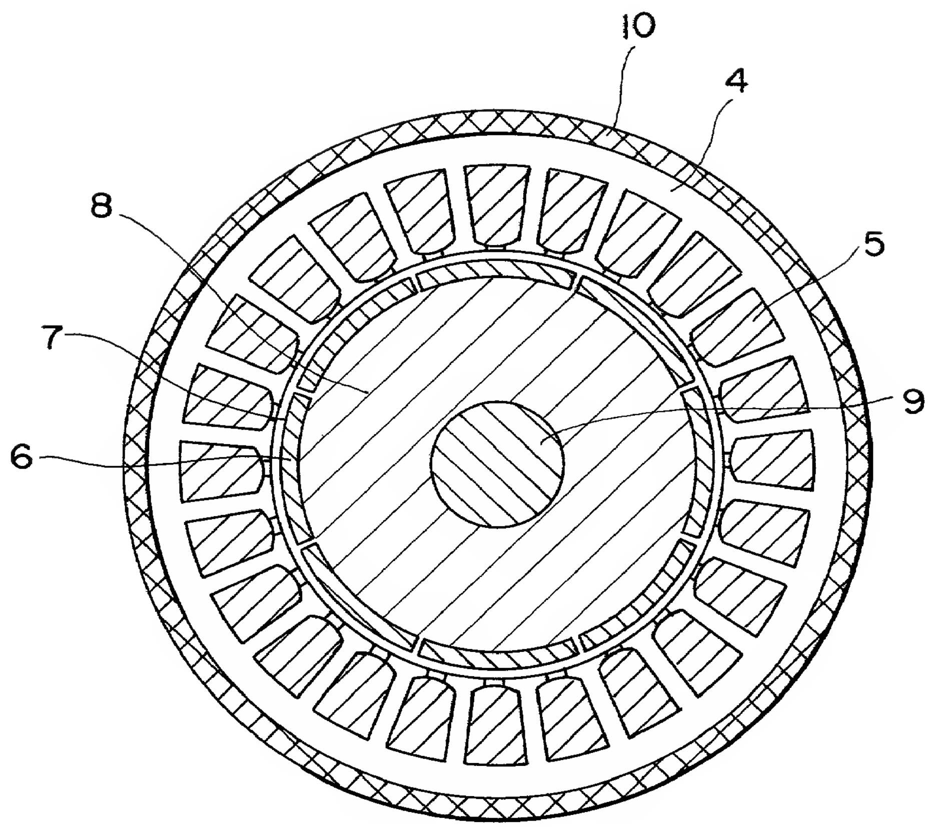
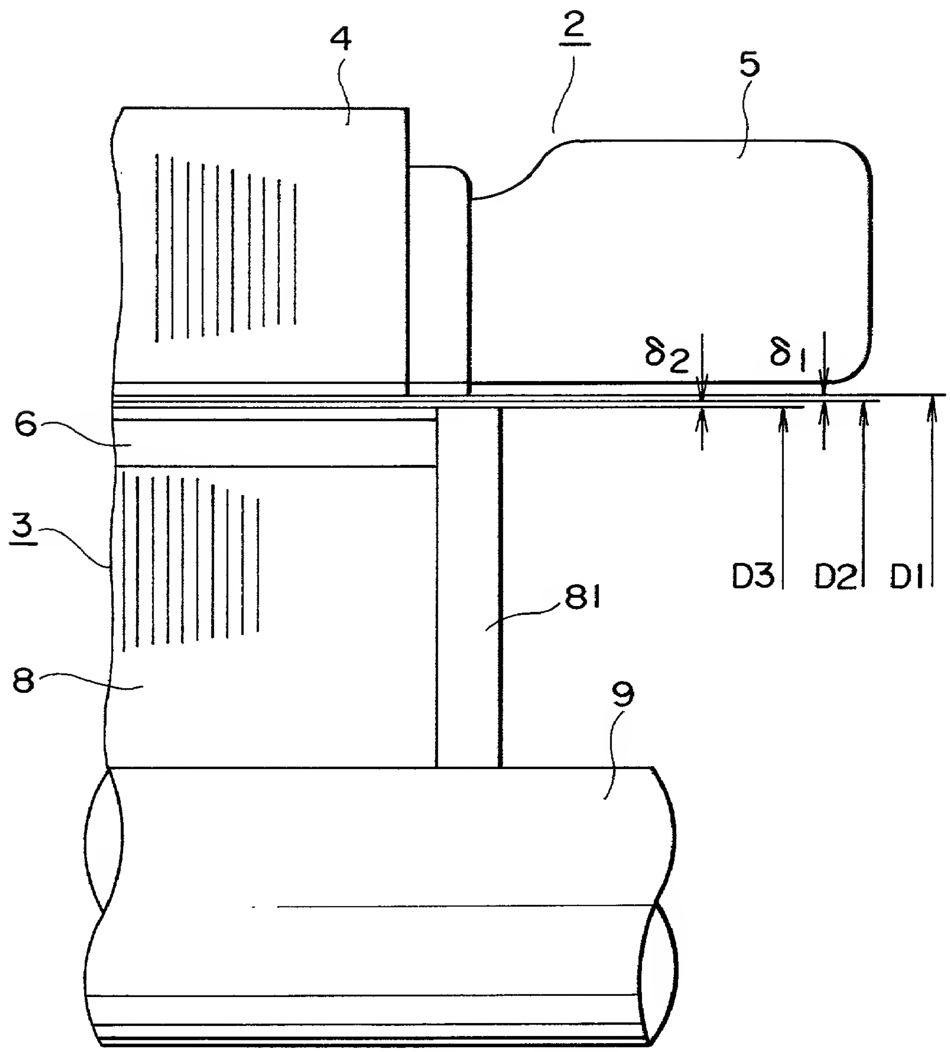


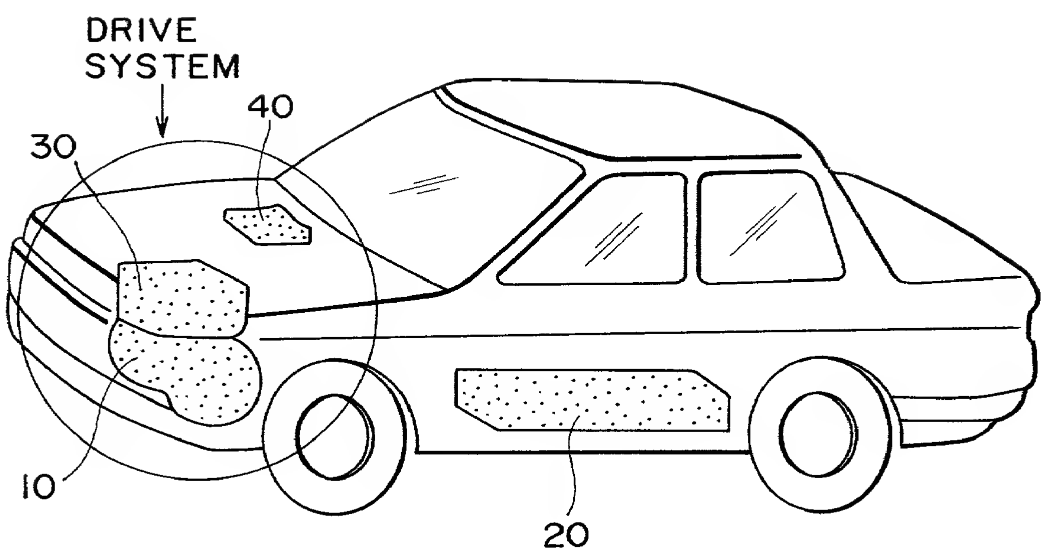
FIG. 2



F I G . 3



F I G. 4



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Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。	As a below named inventor, I hereby declare that:
私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。	My residence, post office address and citizenship are as stated next to my name.
下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者である と（下記の名称が複数の場合）信じています。	I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
______________________ ______________________	PERMANENT MAGNET TYPE ROTARY ELECTRIC MACHINE AND ELECTRICALLY DRIVEN VEHICLE USING THE SAME
上記発明の明細書（下記の欄で×印がついていない場合は、本書に添付）は、	The specification of which is attached hereto unless the following box is checked:
☐ __月__日に提出され、米国出願番号または特許協定条約国際出願番号を____________とし、(該当する場合) ____________に訂正されました。	☐ was filed on as United States Application Number or PCT International Application Number ________________ and was amended on ________________ (if applicable).
私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。	I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.
私は、連邦規則法典第３７編第１条５６項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。	I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration
(日本語宣言書)

私は、米国法典第３５編１１９条 (a) - (d) 項又は３６５条 (b) 項に基き下記の、 米国以外の国の少なくとも一カ国を指定している特許協力条約３６５ (a) 項に基ずく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示している。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)
外国での先行出願

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願年月日)	Priority Not Claimed 優先権主張なし
10-369970	Japan	25/December/1998	☐
			☐

私は、第３５編米国法典１１９条 (e) 項に基いて下記の米国特許出願規定に記載された権利をここに主張いたします。

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) (出願番号)	(Filing Date) (出願日)	(Application No.) (出願番号)	(Filing Date) (出願日)

私は、下記の米国法典第３５編１２０条に基いて下記の米国特許出願に記載された権利、又は米国を指定している特許協力条約３６５条 (c) に基ずく権利をここに主張します。また、本出願の各請求範囲の内容が米国法典第３５編１１２条第１項又は特許協力条約で規定された方法で先行する米国特許出願に開示されていない限り、その先行米国出願書提出日以降で本出願書の日本国内または特許協力条約国際提出日までの期間中に入手された、連邦規則法典第３７編１条５６項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of application.

(Application No.) (出願番号)	(Filing Date) (出願日)	(Status: Patented, Pending, Abandoned) (現況：特許許可済、係属中、放棄済)

私は、私自身の知識に基ずいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じるところに基ずく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第１８編第１００１条に基ずき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration
(日本語宣言書)

委任状： 私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。（弁護士、または代理人の氏名及び登録番号を明記のこと）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name and registration number)

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